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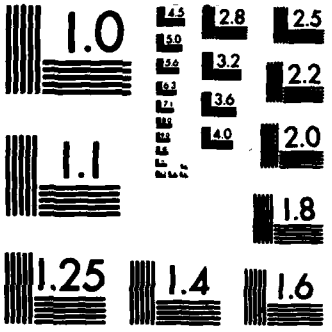

Small and Mesoscale Processes in the Marginal Ice Zone Experiment

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Objectives

The primary objective of our research program is to understand the spacial and temporal behavior of the finestructure in the upper ocean of the marginal ice zone and, in particular, to determine the role that internal waves play in determining the behavior of that finestructure. A secondary objective is to provide high quality temperature and salinity profiles from the surface to the bottom in order to supplement the general hydrography of the region and to provide calibration data for other investigators.

Activities/Accomplishments

During the past year most of our efforts were directed at processing the CTD and current meter records that we obtained while the POLAR QUEEN was moored to ice floes and drifting in the northern Greenland Sea during June and July 1984. Altogether we processed 324 CTD records and 12 current meter records. The salinity and temperature CTD data appear to be of high quality, and the daily surface to bottom profiles have been published in a data report (Foster, McNamara, Bandurraga and Eckert, 1985).

The analysis of the CTD time series data has just started. The temperature, salinity and density profiles have been plotted as time-depth sections. These show both internal wave activity and sharp changes in properties due to water mass transition (Figure 1). A computer program has been written to calculate the dispersion relation of internal waves using the actual density profiles obtained at the time of the observations to compute the Brunt-Väisälä frequency profile. Preliminary calculations have been made of dropped spectra for one series using a newly-developed reconstruction technique. The displacement power spectrum seems to be consistent with the Garrett-Munk universal spectrum for internal waves.

The analysis of the current meter records has also just started. Kinetic energy and temperature spectra have been calculated for some of the current meter records. The kinetic energy spectra are also consistent with the Garrett-Munk universal spectrum while the temperature spectra show deviations near the Brunt-Väisälä frequency similar to that observed in the IWEX data. Coherencies have been calculated for some of the current meter pairs. At the closest horizontal separation (104 meters)

the clockwise rotary velocity coherency was significant at the 95% level for periods greater than about 4000 seconds while at the largest separation (550 meters), only for periods greater than about 6000 seconds. The temperature coherencies were significant at the 95% level for periods greater than about 4000 seconds for the closest pair while the widest pair did not show any significant coherency at long periods. Both pairs showed significant coherency peaks near the Brunt-Väisälä frequency, indicating possible coherent vertical motion at those frequencies.

Future Plans

We plan to continue the analysis of the CTD time series and the current meter records. By combining the results we hope to unravel the spacial and temporal structure of the internal wave field in the marginal ice zone.

Current Publications and Reports

Foster, T.D., B.S. McNamara, T.M. Bandurraga and E.G. Eckert, (1985). Physical Oceanographic Data Marginal Ice Zone Experiment R/V POLAR QUEEN June-July 1984, University of California, Santa Cruz, 166 pp.

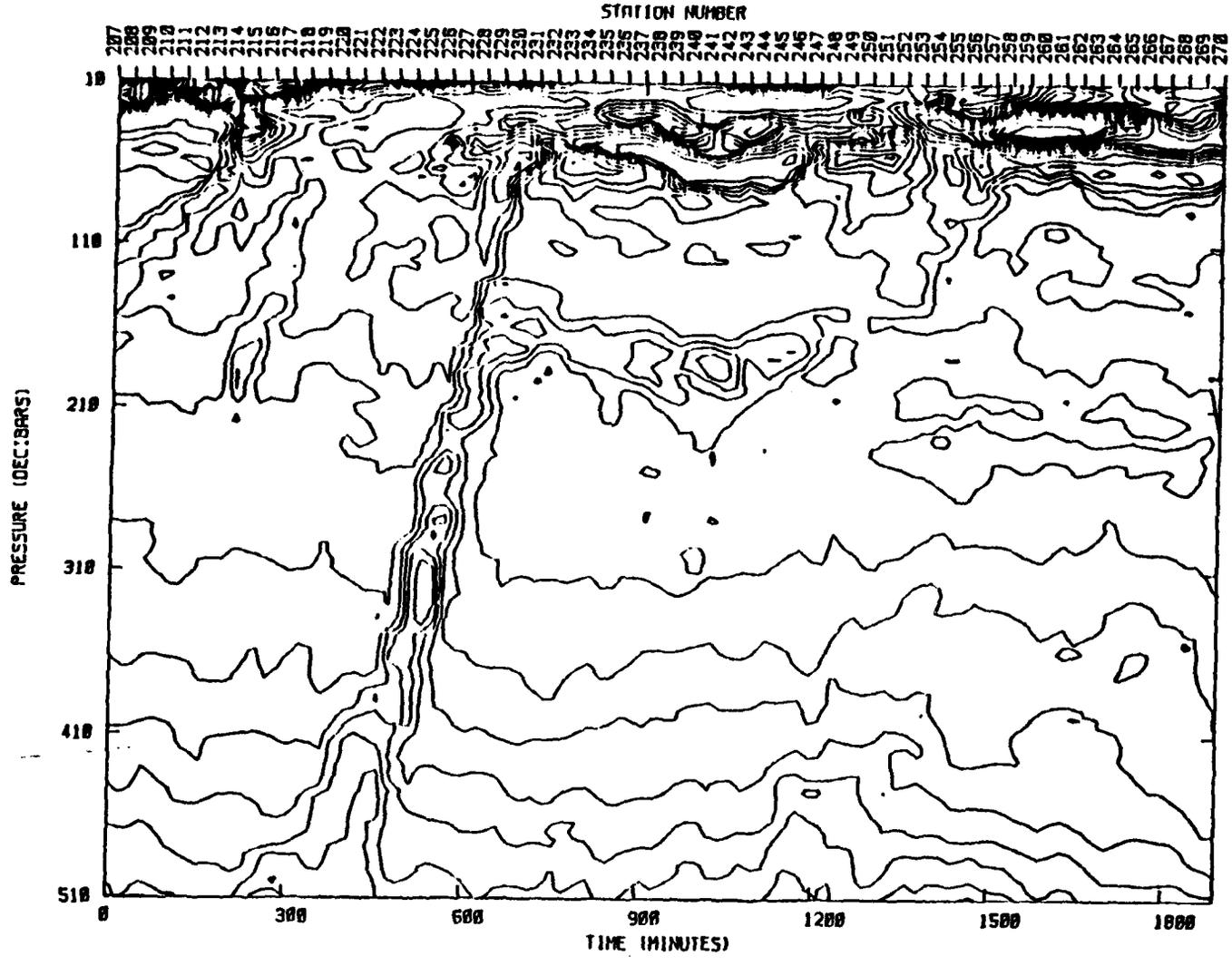

Figure 1. Temperature contours from time series, contour interval 0.2°C.

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